# Occupational Fatality Report

**Kentucky FACE Program**

Report No. 16KY039

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# Mechanic Struck and Killed by Over-Pressurized Suspension Air Spring on Tractor Trailer

## CASE SUMMARY

On Thursday, August 4, 2016, a 50-year-old male mechanic (the victim) was in a pit changing a suspension air spring on a tractor-trailer cab when the over-pressurized air spring exploded and struck his forehead, instantly killing him.

**Figure 1.** Left side air spring after the explosion.

**Recommendations for prevention:**

- Employers should enforce the use of manufacturer's instructions and specifications when replacing suspension air springs.
- Employers should develop and implement a training program for new employees and annual refresher training for those tasks deemed high hazard.
- Employers should develop a formal written safety program and translate written training material into languages that all employees can understand.
- Manufacturers should consider offering manuals and instructions in more than one language.

## EMPLOYER

The employer is a tractor trailer/truck inspection and repair facility employing 20 people, and has been in operation since April 14, 1987.

## EQUIPMENT

Equipment involved includes Continental Conti-Tech Air Spring 9 10S-16 P 382 suspension air springs and a shop air pressure system. A Sterling L Series Tractor Trailer was the vehicle on which the air springs were being installed.


**Figure 2.** Sample of a new air suspension air bag to be installed.

**Figure 3.** The tractor-trailer the installation was taking place.

## SAFETY AND TRAINING PROGRAMS

The company provided safety information to their employees by verbal instruction, weekly team meetings, training sessions, postings, and other written communication such as posters and handouts. They did not have a formal written safety program, and all training was provided in English only. Personal protective equipment was required; for this particular task, safety glasses were required. A progressive disciplinary action plan was in place for violations of safety rules. It is unknown if the victim had ever been disciplined for not wearing PPE, but his safety glasses were in his shirt pocket during the incident. Two employees, designated as first responders, had received formal training on first aid and CPR.

The company had also purchased a Mitchell 1® Maintenance Manual computer software program that provided guidance on safe removal and installation of air springs. The software company was contacted about the availability of the software in other languages; they responded that the software program was available only in English. Interviews of the employees verified there was no formal training for installation of the air springs; training was provided on the job by fellow employees. None of the employees interviewed had utilized the available computer software training, and there were no written records to verify completion or review of the Mitchell 1® Maintenance Manual program.

## VICTIM

The victim was a 50-year-old foreign-born married father. The death certificate indicated that the decedent had completed 8th grade or less. He had been employed with the company since May 27, 2014, as a full- time mechanic.

## INCIDENT SCENE

The incident took place in a concrete pit, which was approximately 5 feet deep and 4 feet wide, and located in the floor of the building. This pit allowed access to the undercarriage of the trucks while allowing employees to remain in a standing position. Both mechanics, the victim and his coworker were working in this area when the incident occurred.

**Figure 4.** View of the pit in which the victim was working at the time of the incident.

**Figure 5.** View of the pit from above.

## WEATHER

The temperature was approximately 76°F at the time of the incident. The humidity was 94%, and the wind was calm.[1] Weather was not considered a factor, since the facility was air-conditioned and the incident took place indoors.

## INVESTIGATION

On Thursday, August 4, 2016, the Kentucky Fatality Assessment and Control Evaluation Program was made aware by Kentucky OSHA of a fatality involving a mechanic. A site visit and investigation were subsequently conducted.

A semi-tractor was being serviced for installation of new suspension air springs. Air suspension is similar to a heavy-duty balloon that is filled with air supplied by a compressor on the vehicle.

When the vehicle carries a heavy load, sensors alert the air compressor to regulate the air pressure according to the change in weight.

On Thursday morning, two mechanics were assigned to work in the pit under a Sterling L Series tractor removing and installing new suspension air springs, a task they had performed regularly for two and half years. During this process, two employees work for more than one hour per axle with 6 or more axles per vehicle, changing suspension air bags or springs up to five days a week. The two mechanics had a combined five years on-the-job experience at this assigned task.

**Figure 6. Air spring after the explosion**.

At approximately 9:00 am, the mechanics installed a new suspension air spring on the left forward rear axle of the vehicle's tractor. They used the air from the shop air compressor to fill the air bag. The shop air compressor pressure was set to 175 psi. The vehicle air system on the truck that is normally used to fill the air springs is set to 120 psi. Using the vehicle air system is recommended in the manufacturer's instruction on installation of air springs.

Instead of using a jack and jack stands to raise the axle, it was common practice for the employees to use the shop air system connected to the vehicle air system to raise the axle. As they were raising the left rear frame with the newly installed suspension air spring, the air spring exploded from the over pressurization, hitting the victim in the forehead. The victim's safety glasses were in his pocket at the time of the explosion.

Emergency medical services were immediately contacted, but the victim was pronounced dead at the scene by the coroner.

## CAUSE OF DEATH

The cause of death was an open head injury.

## CONTRIBUTING FACTORS

This investigation identified the following factors that contributed to the fatality:

- Lack of safety training on installation and removal of air springs
- Not following the manufacturer's instruction for psi
- Use of shop air compressor instead of truck's air system
- Failing to use jack stands to raise the axle

## RECOMMENDATIONS AND DISCUSSIONS

***Recommendation No. 1:*** **Employers should enforce the use of manufacturer's instructions and specifications when replacing suspension air springs**.

Manufacturer instruction states that jacks and chalks should always be used to secure a vehicle. The employees used the shop air compressor instead of jacks and jack stands to lift the tractor. The manufacturer also recommends no more than 100 psi for the air spring. The employees used the shop air compressor, which was set to a pressure of 175 psi. The truck's air system was set to 120 psi; however, the truck is equipped with a computerized sensor that detects the volume of air needed, depending on the weight of the load. It fills the air spring and shuts off automatically when it has the correct volume of air.

Installation Instructions of ContiTech Air Springs [2] (photographs not shown)

1. ***Have your new air spring system ready.*** *The best way to change an air spring is to use a complete system and to exchange axle wise. Please always refer to the mounting instructions of your vehicle manufacture.*
2. ***Deflate your air spring.*** *Always secure your vehicle first and make sure it remains stable during the entire process. Deflate your air spring and keep the air pressure system and ignition completely switched off. Attention: the distance between chassis and ground will be reduced.*

3. ***Loosen pneumatic valves.*** *When loosening the valve from the air inlet make sure the compressor is still switched off. Remove air connection and make sure both the valve and the air pipe stay clean.*
4. ***Loosen all screws.*** *First, loosen all screws connecting the air spring system to the chassis. Then loosen all screws connecting the air spring system to the axle.*
5. ***Preparation for installment of the new air spring.*** *Remove the defect air spring system. Clean the faying surface and look for corrosion. Keep the air pipe closed against dirt or dust at all times.*
6. ***Inspect all other air springs on your vehicle.*** *Check for abrasion, embrittlement and cracks in the rubber parts. Check metal parts for corrosion. Check plastic parts for capillary cracks. Check for possible contamination by lubricants such as oil, diesel, brake or cooling fluids. Remove all foreign objects such as stones or dirt. Remove all liquids and check source of contamination.*
7. ***Put your new air spring in place.*** *Install the new air spring system between chassis and axle and insert screws (new ones if the old ones are corroded or the threads are worn down.) Tighten the top plate to the chassis first. Attention: make sure you use the correct torque, which is recommended by your vehicle manufacturer or the catalog. Leave the air inlet open.*
8. ***Tighten your new air spring.*** *Pull down the piston until it touches the mounting plate (if necessary use the compressed air gun with max 0.3 bar). Compulsively comply with the height limit. Now tighten the piston to the axle with a torque key making sure to use the correct torque recommended by your vehicle manufacturer or in the catalogue.*
9. ***Inflate your new air spring system.*** *Connect pneumatic valve with the air inlet of the new air spring also with the recommended torque. Inflate your air spring with the commended working pressure, release the safety catch of your vehicle and put it back into driving position.*

***Recommendation No. 2:*** **Employers should develop and implement a training program for new employees and annual refresher training for those tasks deemed high hazard.**

The mechanics had not been formally trained on the installation of the air springs; the only training provided was hands-on from other experienced employees. Employees should receive language and literacy appropriate targeted training on how to properly fill air springs, reducing the risk of over pressurizing by improper use of an air compressor.

The employer had purchased the Mitchell 1® Maintenance Manual computer software that provided information on the safe removal and installation of the air springs; however, the software was offered in English only. Use of the manufacturer's instructions or the use of the Mitchell 1® Maintenance Manual was not enforced. The victim's proficiency in English is unknown. In the absence of translated written training material, an interpreter could have been provided to instruct any employee who may not have been able to understand written English, with hands on training conducted afterwards to ensure the employee understood the instructions.

***Recommendation No. 3:*** **Employers should develop a formal written safety program and translate written training material into languages that all employees can understand.**

The employer had 20 employees, and required personal protective equipment (PPE) be worn during certain tasks, including the task being performed at the time of the incident. According to OSHA 29 CFR 1910 Subpart I[3], any task or work situation that requires the use of eye, face, head, foot, or hand protection is required to have a written hazard assessment. A formal written safety program would have included the PPE requirement, and instructed employees on when the PPE was necessary, how to properly don, doff, adjust, and wear PPE, how to properly care for the PPE, and what the limitations of the PPE were.

It is equally important to provide the written program, including the hazard assessment and PPE requirements, in a language that employees can read and understand since English was not every employee's first language. According to a memorandum sent April 28, 2010 from David Michaels, Assistant Secretary for Occupational Safety and Health[4], *"… an employer must instruct its employees using both a language and vocabulary that the employees can understand. For example, if an employee does not speak or comprehend English, instruction must be provided in a language the employee can understand."* The training material should have been translated into languages that all employees could understand, and made available to employees upon request.

***Recommendation No. 4:*** **Manufacturers should consider offering manuals and instructions in more than one language.**

The employer had several workers whose first language was not English, and it is unknown whether all employees could read in English. Providing manuals and instructions in a language that is familiar and easily understood removes the possibility of misunderstanding and avoiding safety risk issues.

In 2015, The Washington Times reported that 21 percent of U.S. residents speak a language other than English at home.[5] The article goes on to state that 25 million residents reported they speak English at levels they would rate as less than "very well". The most commonly spoken language in American households other than English is Spanish, with more than 39 million residents speaking it in their homes, a rise of over 11 million when compared to 2001. This data shows a pressing need for foreign language instructions, and strongly suggests that manufacturers should consider providing information on how to safely operate their equipment in languages other than English, particularly in Spanish.

## KEYWORDS

Air springs
Truck suspension systems
Air pressure
Workshop
Over pressurizing

## REFERENCES

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[4] Memorandum For: Regional Administrators, *OSHA Training Standards Policy* https://www.osha.gov/dep/standards-policy-statement-memo-04-28-10.html

[5] Dinan, S. (2015, October 6). English isn't main language at home for 21 percent in America. The Washington Times. Retrieved from https://www.washingtontimes.com/news/2015/oct/6/english-isnt-main-language-at-home-for-21-in-ameri/

## PHOTO CREDIT

Photos are courtesy of Kentucky OSHA.

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**Please take the time to complete our brief survey regarding this report.**

**DISCLAIMER**

This case report was developed to draw the attention of employers and employees to a serious safety hazard and is based on preliminary data only. This publication does not represent final determinations regarding the nature of the incident, cause of the injury, or fault of employer, employee, or any party involved.

This case report was developed by the Kentucky Fatality Assessment and Control Evaluation (FACE) Program. Kentucky FACE is a NIOSH-funded occupational fatality surveillance program with the goal of preventing fatal work injuries by studying the worker, the work environment, and the role of management, engineering, and behavioral changes in preventing future injuries. The FACE Program is located in the Kentucky Injury Prevention and Research Center (KIPRC). KIPRC is a bona fide agent for the Kentucky Department for Public Health.

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